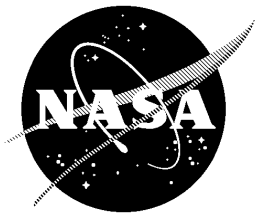
MISSION SERVICES PROGRAM

SPACE NETWORK (SN)
WEB SERVICES INTERFACE (SWSI)
PRODUCT MANAGEMENT PLAN

Original

February 2002



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Space Network (SN) Web Services Interface (SWSI) Product Management Plan

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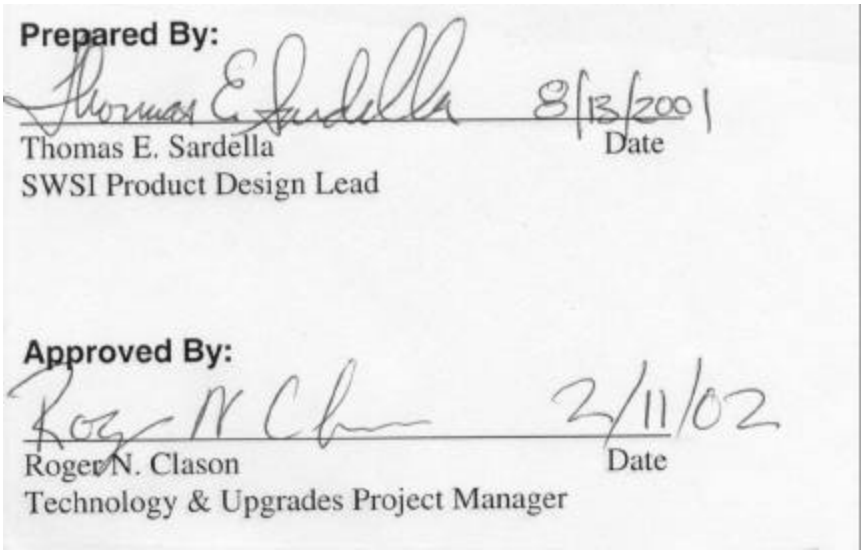

Goddard Space Flight Center
Greenbelt, Maryland

Preface

This Product Management Plan establishes the approach for managing the implementation of the Space Network (SN) Web Services Interface (SWSI), and constitutes an agreement between the SWSI Product Design Lead and the GSFC Data Services Upgrades Manager.

This document is under the configuration management of the Space Network Project. Proposed changes to this document shall be submitted to the Space Network Project along with supportive material justifying the proposed change. Changes to this document shall be made by Document Change Notice (DCN) or by complete revision.

Direct all comments, questions, or suggestions regarding this document to:

SWSI Product Design Lead
Code 453
Goddard Space Flight Center
Greenbelt, Maryland 20771

Change Information Page

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Document History			
Document Number	**Status/Issue**	**Publication Date**	**CCR Number**
453-PMP-SWSI	Original Issue	February 2002	450/136

DCN Control Sheet

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Section 1. Introduction

1.1 Purpose

The purpose of this document is to describe the Space Network (SN) Web Services Interface (SWSI) implementation. The major driver is to provide a standards-based customer interface for performing Tracking and Data Relay Satellite (TDRS) scheduling and real-time service monitoring and control. The intent of the SWSI is not to replace existing scheduling and real-time systems for all SN customers. It is rather to provide a simple low-cost interface option, especially for suborbital and infrequent SN customers.

1.1.1 Background

The interface between a customer Mission Operations Center (MOC) and the Network Control Center Data System (NCCDS) consists of formatted messages exchanged electronically using either Nascom 4800 Bit Block (BB) protocol or Transmission Control Protocol (TCP). This interface is described in detail in the NCCDS/MOC Interface Control Document (ICD). New SN customers have traditionally been provided with a limited number of options for implementing this interface. A full-featured SN scheduling tool is provided by the User Planning System (UPS), which runs on a Hewlett-Packard (HP) Unix host. New customers desiring to use UPS for scheduling must either purchase their own system at a cost of approximately $35K per system, or interface with an institutional UPS located within the Multisatellite Operations Control Center (MSOCC). A NASA Integrated Services Network (NISN) Closed Internet Protocol (IP) Operational Network (IONET) connection is required for the latter option.

No standard option exists to provide a real-time (reconfiguration and performance data monitoring) interface. All SN customers have been required to implement their own systems at considerable cost.

Prospective SN customers have brought to light the need for a simple, standard, readily available interface to the NCCDS. In response to this need, NASA funded an in-house project to determine the feasibility of such a tool. This project resulted in a prototype of a web-based cross-platform customer interface to the NCC, called the SN Web Services Interface (SWSI). Prototyping and proof of concept work was completed and has been used to provide support to the Long Duration Balloon Project (LDBP).

The final operational SWSI is a follow-on to the prototype effort and will provide improvements in the form of a Java-based Graphical User Interface (GUI) and better management of user schedule information. Using the SWSI, SN customers will be able to perform scheduling, real-time functions, and state vector storage for only the cost of a desktop computer or workstation. A web browser and a Java virtual machine, both of which are freely available, will also be required. The SWSI is designed to be accessed from the NISN Closed IONET or Open IONET. NISN's Open IONET allows access from the NASA Science Internet and the public Internet, thus allowing cooperation with NASA's university, enterprise, and inter/intra-agency partners.

This Product Management Plan (PMP) covers the SWSI product development cycle beginning with the period after the technology demonstration phase and terminates with completion of the implementation phase.

1.1.2 Scope

This PMP applies to those activities that are being managed by the SWSI Product Design Lead. The SWSI PMP encompasses the policy, organization, control, direction, resources and responsibilities that apply to the SWSI procurement, implementation, installation, integration, testing and acceptance. This document has been developed in accordance with the *Mission Services Program Office System Management Plan (SMP) Document No. 450-PG-8700.2.2* and the *Space Network (SN) Project Plan Document No. 451-MGMT-001*.

1.1.3 Applicable Documents

a. *Space Network (SN) Project Plan, Document No. 451-MGMT-001*

b. *Quality Program Provisions for Aeronautical and Space Systems Contractors, NHB 5300.4(1B)*

c. *Maintainability Program for Systems and Equipment, MIL-HDBK-470*

d. *Maintainability for Verification/Demonstration/Evaluation, MIL-HDBK-471*

e. *Mission Services Program Office Configuration Management Plan, 450-PG-8700.2.1*

f. *Mission Services Program Office Quality Assurance Plan, 450-PG-8730.3.1*

g. *Mission Services Program Office Systems Management Plan (SMP), 450-PG-8700.2.2*

h. *Standard for Product Data Packages, 500-TIP-3109*

i. *NASA Policy Directive (NPD) 2810.1, NASA Policy for Security of Information Technology*

j. *NASA Procedures and Guidelines (NPG) 2810.1, Security of Information Technology*

k. *GSFC Security Manual, Goddard Handbook (GHB) 1600.1B*

l. *NASA Safety Policy and Requirements Handbook, NHB 1700.1*

m. *Interface Control Document Between the Network Control Center Data System and Mission Operations Center, 530-ICD-NCCDS/MOC*

n. *Network Control Center Data System (NCCDS) System Requirements, 1998, 530-SRD-NCCDS/1998*

o. *Network Control Center (NCC) User Planning System (UPS) System Requirements Specification, Document No. 511-4SRD/0196*

p. *Network Systems Integration & Analysis Master Test Plan for Network Control Center Data Systems, CSOC-GSFC-TEST-000924*

q. *Collector Project Commitment Document (PCD) for GSFC Data Services*

1.2 Objectives

The objectives of the SWSI are:

a. Provide a standards-based web interface to the NCCDS to perform customer scheduling, real-time service monitoring and control, and state vector storage.
b. Support all full support customer messages as defined in NCCDS/MOC ICD.
c. Allow access from NISN Closed IONET, Open IONET, and Internet.
d. Provide for secure message exchange using encryption.
e. Provide a High Availability (HA) configuration to adhere to existing NCC Reliability/Maintainability/Availability (RMA) requirements.
f. Implement the SWSI with a goal of minimizing acquisition, development, and life cycle cost.
g. Provide customer access to Tracking and Data Relay Satellite System (TDRSS) Unscheduled Time (TUT) information from the Open IONET and Internet.

1.3 Overall Approach

The approach of the SWSI product development and deployment is to establish a basic capability for performing web-based SN customer scheduling and real-time functions. The basic infrastructure may be added to at later dates to include more advanced capabilities, such as increased automation of manual functions. The basic infrastructure will provide for secure message exchange on all NISN and open networks and will implement the complete NCCDS customer interface. Commercial Off-The-Shelf (COTS) products (hardware, system software, database tools, and security tools) will be used to the extent possible. Since no other commercial or government application exists to perform the NCCDS interface function, much of the SWSI effort will consist of custom software development to be performed by a government/contractor team. Some code reuse is expected from the Java-based Spacecraft Web Interface to Telemetry and Command Handling (Jswitch) project, which performs a similar function to SWSI and upon which the SWSI design is based.

1.4 Plan Maintenance and Control

The SWSI Product Management Plan is under the control of the Goddard Space Flight Center (GSFC) Flight Projects Directorate (FPD) Mission Services Program (MSP) Project SN Project Configuration Control Board (CCB) and is maintained as a baseline document. Changes in this plan will be issued as revisions. A review of this plan will take place as required. An updated or revised version will be published as required. Control of resource estimates is exercised through the Program Operating Plan (POP) budgeting cycle. Product Status is reported at Code 450 Project Monthly Reviews and SN Project Staff Meetings.

1.5 Implementation Authority

Authority for this activity is contained in the POP under the Unique Project Number (UPN) 218-10. The approval of the Space Operations Management Office (SOMO) is contained in the Collector Project Commitment Document (PCD) for GSFC Data Services under Web-based NCC Services Interface Product.

Section 2. Management

2.1 General

To achieve the SWSI implementation objectives of optimizing life cycle costs and providing a simple low-cost SN customer interface, a management approach is being adopted that capitalizes on experience gained from the Network Control Center (NCC) Project. This approach shall employ an existing management structure with the authority and responsibility residing with the SWSI Product Design Lead. Other resources shall be utilized when appropriate.

2.2 NASA Responsibilities

2.2.1 Organization

SWSI Product Design Team organizational relationships and matrixed personnel are shown in Figure 2-1. The functional responsibilities of key personnel for the SWSI are shown in Table 2-1.

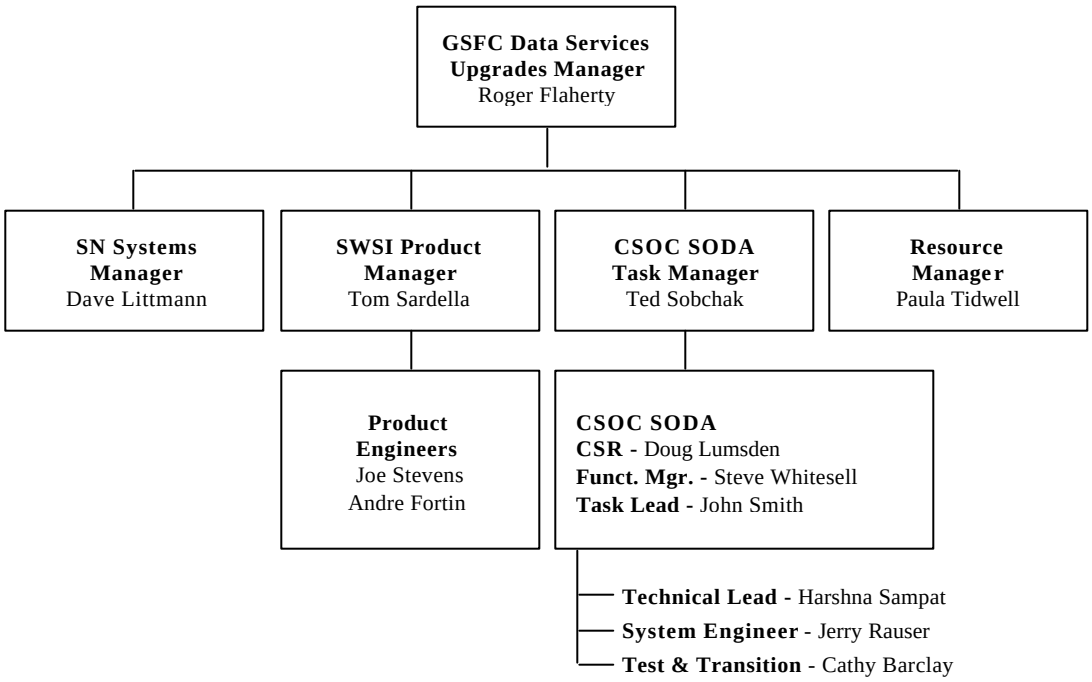

Figure 2-1 Organization

Table 2-1 Responsibility Matrix

	PRODUCT DESIGN LEAD (NASA)	SN SYSTEMS MANAGER (NASA)	RESOURCE MANAGER (NASA)	PRODUCT ENGINEERS (NASA)	TEST & TRANSITION MANAGER (CSOC)	SODA TASK MANAGER (NASA)	SODA CSR/TASK LEAD (CSOC)	SODA SYSTEMS ENGINEER (CSOC)	SODA DEVELOPMENT ENGINEERS	INTEGRATION & TEST	OPERATIONS & MAINTENANCE (CSOC
Product Management	**v**						**v**	**A**	**A**		
Interface to Systems Engineering Team		**v**						**A**			
SODA Task Management						**v**	**v**				
Cost/Schedule Control	**v**		**v**				**v**	**A**			
Configuration Management	**v**				**A**	**A**		**A**	**v**		**A**
Requirements, Specifications and ICDs	**v**	**v**		**v**				**v**	**A**	**A**	**A**
Design	**v**			**v**				**A**	**v**		
Verification Planning	**v**				**v**			**v**	**A**	**v**	**A**
Security	**v**	**v**		**v**	**v**			**A**	**v**	**A**	
Development	**v**			**v**				**A**	**v**	**A**	**A**
Integration and Test	**A**			**A**	**v**			**A**	**A**	**v**	**A**
Installation								**A**	**A**	**A**	**v**
Installation Test					**v**			**A**	**A**	**v**	**v**
Acceptance Tests	**A**			A	**v**			**A**	**A**	**v**	**v**
Training								**A**	**A**	**A**	**v**
Integrated Logistics Support Plan								**A**	**A**		**v**
Product Assurance	**v**				**v**			**A**	**A**		**v**
Operations and Maintenance Concept		**v**						**A**			**v**
Transition to Operations		**v**			**v**			**A**		**A**	**v**
A = Assist											

2.2.2 Definitions

Product Management - Ensure the performance of all management functions necessary for delivery of the SWSI product. Direct and control system definition, design development, and validation of the system. Develop and implement the product plan to define the schedules and to identify, justify, allocate, obligate, account, and manage fiscal and human resources (civil service and contractor) necessary to deliver the SWSI product. Liaison with other NASA programs and offices is performed under this responsibility.

Interface to Systems Engineering Team - Advise the Product Design Lead of SN system requirements that could affect the implementation of the SWSI. Monitor the SWSI implementation to ensure compatibility with as-built and/or future installations.

SODA Task Management - Management of the support provided to the SWSI Product Design Lead via Consolidated Space Operations Contract (CSOC) Space Operations Directive Agreement (SODA).

Cost/Schedule Control - Establish and support a formal performance measurement system that will realistically monitor the actual work completed versus the budget and schedule agreements. Prepare all financial and schedule performance and status reports to permit upper levels of management to exercise necessary cost/schedule control over the SWSI product.

Configuration Management – Maintain system requirements and documentation baselines in a disciplined and traceable manner to support the development and delivery of the product. This term also applies to the change control process(es) applicable to the integrity of each deliverable software Configuration Item (CI).

Requirements and Specifications - Establish and maintain all system requirements for the product. Allocate system functional and performance requirements and specifications to hardware and software functions; generate software requirements specifications and software interface requirements specifications. Approve all hardware and software design specifications.

Design – Perform and maintain the system design necessary to meet the overall SWSI specifications. Conduct all design reviews.

Verification Planning – Generate all system level test plans and supporting documentation. Conduct system level performance analyses to ensure that the SWSI will demonstrate that all requirements have been met. Approve system level test procedures. Approve all hardware and software configuration item test plans and procedures.

Security – Ensure equipment, material, and procedures are present which provide personnel, physical, communications, computer, and information security in accordance with NASA and Designated Approving Authority (DAA) directives and guidance. Perform a security assessment at the appropriate point.

Development – Develop and build hardware, software and firmware systems to meet requirements. Perform appropriate subunit tests. Maintain development documentation for all new development items. Prepare appropriate engineering changes.

Integration & Test – Integrate and test each deliverable CI.

Installation - Perform the installation of the deliverable system(s) at the appropriate sites.

Installation Test – Conduct tests on systems and components to identify any damage due to shipping, and to verify that assembly and integration procedures have been correctly performed.

Acceptance Tests – Conduct system and subsystem tests to verify and validate adherence to requirements.

Training - Develop plans and procedures to ensure all Operations and Maintenance (O&M) of the SWSI are performed in a safe and satisfactory manner. Classroom training and actual equipment training are included in this responsibility.

Integrated Logistics Support Plan - Provide logistics support to the SWSI product effort including provision of spare mechanical and electronic parts and the procurement of equipment and materials necessary to support operation and maintenance functions.

Product Assurance - Control all phases of SWSI product development to ensure that systems meet the standards and tolerances as required by *NHB 5300.4(1B)*, *MIL-HDBK-470*, and *MIL-HDBK-471*.

Operations and Maintenance Concept – Develop plans and concepts to operate and maintain the SWSI within the SN. Develop plans and procedures to conduct corrective and preventive maintenance on all systems and subsystems.

Transition to Operations – Perform activities that are necessary to deploy SWSI to make it available to support SN customers.

2.3 Contractor Responsibilities

Hardware installation, software development and integration, operations and engineering testing, and transition to operations shall be implemented through a CSOC SODA Task**.**

2.4 Configuration Management

2.4.1 Configuration Control Board

A CCB shall be established. The SWSI Product Design Lead shall function as the head of this board and shall have approval authority over all Configuration Change Requests (CCRs). The head of the SWSI CCB shall instigate CCRs to be reviewed by the appropriate NASA personnel prior to approval by the board. The SWSI CCB shall consist of the following members or their representatives:

- Product Design Lead (NASA)
- SN System Manager (NASA)
- Product Engineers (NASA)
- GSFC IOA CSOC Architect
- SODA Systems Engineer (CSOC)
- SODA Software Development (CSOC)
- Integration & Test Engineers (CSOC)
- Operations & Maintenance [CSOC Completion Form (CF)]

The head of the SWSI CCB shall instigate CCRs to be reviewed by and receive input from all board members prior to its approval.

Configuration changes that interface with other systems or projects shall be submitted to the cognizant CCB(s)/Systems Engineering Review Boards (SERB) for concurrence and approval. The CCB shall work closely with the CSOC SERB during transition to operations.

2.4.2 Configuration Management Plan and Quality Assurance

The implementation contractor shall conform to the Configuration Management (CM) quidelines defined in the *MSPO Configuration Management Plan 450-PG-8700.2.1*. Quality assurance and performance verification shall conform to the *MSPO Quality Assurance Plan 450-PG-8730.3.1*.

2.5 Data Management

New documents and drawings shall be prepared in accordance with the requirements defined in the *MSPO Systems Management Plan (SMP), 450-PG-8700.2.2*, and the *Standard for Product Data Packages, 500-TIP-3109*.

2.6 Schedule

Product Development Review (PDR)	06/01/00
Detailed Design	04/15/00 – 07/07/00
Requirements/Design Review (R/DR)	07/07/00
Build 1 Development	07/07/00 - 12/29/00
Code and Test	07/07/00 – 11/30/00
System Testing	12/01/00 – 12/29/00
Build 2 Development	11/01/00 - 03/30/01
Code and Test	11/01/00 - 02/28/01
System Testing	03/01/01 - 03/31/01
Test Readiness Review (TRR)	04/01/01
Acceptance Testing	04/02/01 - 04/30/01
Final Hardware Installation	05/01/01 - 05/31/01
Operations Readiness Review (ORR)	06/01/01
Transition to Operations	06/15/01

Figure 2-2 SWSI Schedule

2.7 Resources

2.7.1 Product Budget

SWSI funding requirements are based on the POP-00 budget exercise. Funding shall be provided under UPN 218-10 and UPN 224-10.

2.7.2 Labor Requirements

An estimate of Civil Service and Product support contractor requirements are provided in Tables 2-2 and 2-3 respectively. These estimates are based on past NCCDS Project experience.

Table 2-2 SWSI Detailed Labor Requirements - Civil Service

POSITION	FY00	FY01	TOTAL
SWSI PRODUCT DESIGN LEAD	.7	.7	1.4
RESOURCE MANAGER	.1	.1	.2
PRODUCT ENGINEERS	1.0	1.0	2.0
TOTAL	1.8	1.8	3.6

Table 2-3 SWSI Detailed Labor Requirements - Contractor

PRODUCT SYS ENG SUPPORT	FY00	FY01	TOTAL
MANAGEMENT SUPPORT	.1	.1	.2
SYSTEMS ENGINEERING	.5	.4	.9
SYSTEMS DEVELOPMENT ENGINEERING	2.4	2.9	5.3
INTEGRATION & TEST	.25	.45	.7
DOCUMENTATION	.1	.1	.2
OPERATIONS TRANSITION/TRAINING	0	.2	.2
TOTAL	3.35	4.15	7.5

2.7.3 Cost Estimates

The cost estimates for the SWSI Product are available from the SWSI Product Design Lead.

2.8 Controls

The SWSI Product Design Lead shall exercise control of the implementation budget, schedules, procurements, risk management planning, requirements performance and baseline documents. This control shall be maintained through the configuration management process defined in Section 2.4, the Performance Verification Plan regular status meetings, monthly technical and financial reviews, and an action item reporting system. The formats of reviews and action item

reporting shall be developed by the implementation contractor and approved by the Product Design Lead.

2.9 Implementation Approach and Milestones

2.9.1 Implementation Approach

The implementation approach will follow traditional waterfall model. However, due to schedule limitations and an attempt to get some of the benefits of a spiral model, the development phases will have significant overlap.

2.9.2 Implementation Milestones

The life-cycle reviews that will be conducted are listed below:

- Product Development Review (PDR)
- Requirements Design Review (R/DR)
- Test Readiness Review (TRR)
- ORR/Transition Readiness Review (TRR)

The Preliminary Design Review was completed in conjunction with the prototyping activities. The R/DR will be a peer review to be conducted after the completion of the draft System Requirements Document and System Design Specification.

2.10 Reporting Requirements

2.10.1 Monthly Status Reviews

The implementation contractors shall present a monthly oral review to the SWSI Product Design Lead reviewing the technical status and indicating progress in achieving scheduled project milestones. The Monthly Status Review (MSR) package shall suffice as a Monthly Progress Report (MPR).

The SWSI Product Design Lead shall present the product status to the GSFC Data Services Upgrades Manager. The review shall cover the significant aspects of the project, including technical progress, schedule adherence, and resource utilization. Performance measurement reports shall be presented at these reviews. Emphasis shall be placed on the accomplishments for the concluded reporting period, the planned project activity for the next reporting period, and the identification and resolution of all issues and problems.

2.10.2 Action Item Report

The implementation contractor shall submit a weekly report of action items that ensures the actions to be taken are clearly defined and responsibility is assigned. The report shall indicate which items are closed and the rationale for closure, which items are open, and the scheduled closure date. This report shall note any changes in the progress/status of action items since the last report.

2.10.3 Metrics

The implementation contractor shall submit a weekly report of metrics related to the progress and quality of the product. This report will specify the following metrics when applicable:

- Number of units/files planned/completed
- Number of Delivered Source Instructions (DSI) in each unit/file
- Number of test cases planned/completed
- Number of Problem Reports (PRs) generated against the product by priority and status
- The computed error rate/KDSI

Based on new development in NCC 98, the quality goal for this PMP is 5 errors/KDSI.

2.11 Evaluation Process

2.11.1 Performance Assurance

2.11.1.1 Product Validation Planning

A Product Validation Plan shall be developed which identifies acceptance criteria for product validation. Details of this plan shall be contained in several documents. A Test Requirements Verification Matrix (TRVM) shall provide traceability to specific test procedures. The methodology along with test procedures and matrix development review cycles are identified in the *Network Systems Integration & Analysis Master Test Plan for Network Control Center Data Systems, CSOC-GSFC-TEST-000924.*

2.11.1.2 Document Review

All project documents shall be reviewed and approved by the SWSI Product Design Lead prior to release. The Implementation Contractor shall submit for the Product Design Lead's approval a table defining the documents to be prepared for this product. This table shall list the document name, the date the format was approved, the current status; the date drafts are delivered for approval, and the approval date. This table shall be included in the slides presented at the Monthly Status Review.

2.11.1.3 Lessons Learned

Lessons learned will be submitted to the Flight Programs and Projects Directorate (FPPD) Lessons Learned Database at http://fpd.gsfc.nasa.gov/llis.html for possible inclusion into the NASA HQ Lessons Learned Information System at http://llis.nasa.gov/llis/llis.html.

2.12 Security

The SWSI implementation shall comply with the security policies and procedures established in the *NASA Policy Directive (NPD) 2810.1, NASA Policy for Security of Information Technology*, and the *NASA Procedures and Guidelines (NPG) 2810.1, Security of Information Technology*.

2.13 Safety

The SWSI implementation shall comply with the safety policies and procedures established in the *NASA Safety Policy and Requirements Handbook, NASA Handbook (NHB) 1700.1*.

Section 3. Technical Summary

3.1 General

The SWSI Implementation will result in a new generation low cost cross-platform solution for scheduling Space Network services. A web-based approach means that the solution will be cross-platform compatible, since there are web browsers and Java virtual machines available for almost every computer platform [Personal Computer (PC), Macintosh, Unix, and the like]. The web browser and Java provide a reduced hardware dependency for the customer's Mission Operations Center (MOC). All MOCs use either PC, Unix, or Macintosh workstations, or some combination of the three.

3.2 Architecture

Figure 3-1 depicts the overall SWSI architecture. The SWSI prototype provided Hypertext Markup Language (HTML) forms for the user to enter requests such as schedule and reconfiguration requests and to display results such as user schedules and user performance data. The final operational SWSI is instead Java-based and is based on work previously performed on the Java-based Spacecraft Web Interface to Telemetry and Command Handling (Jswitch). Jswitch objectives are very similar to those of SWSI in that it provides a secure, platform-independent user interface to a spacecraft MOC from any network, including the Internet.

SWSI customers will be provided with client software capable of executing on multiple platforms using Java Virtual Machine from Sun Microsystems. Clients will establish connections to a SWSI server using the Secure Socket Layer (SSL) protocol and authentication with digital certificates. Two sets of SWSI servers are provided to allow access from clients via both the Open IONET and Closed IONET. The Open SWSI Server will act as a proxy, routing requests from Open IONET and Internet-based customers to the Closed SWSI Server using encrypted connections through the NISN Secure Gateway.

The Closed SWSI Server establishes the appropriate TCP connections with the NCCDS and performs an exchange of messages according to the formats defined in the NCCDS/MOC ICD. A separate set of connections is maintained on behalf of each SWSI customer. Schedule information returned from the NCCDS in the form of User Schedule Messages (USMs) is stored in a database on the Closed SWSI Server for later customer viewing.

In addition to providing a Java interface to SN customers for performing scheduling and real-time functions, SWSI will also provide an HTML-based web page for displaying TUT information. The current NCCDS provides TUT service on the Closed IONET only. An identical service will be provided by SWSI for Open IONET and Internet-based customers. This will be accomplished by the Closed SWSI Server periodically downloading the information from the NCCDS TUT Server and passing it to the Open SWSI Server through the Secure Gateway. The Open SWSI Server will then display TUT using the same software as is used on the NCCDS TUT Server.

This PMP describes the activities involved for a portion of the equipment depicted in Figure 3-1. The efforts described herein shall result in the development, integration and test of four operational SWSI servers.

3.3 Formulation Process

3.3.1 Documentation Requirements

Technical requirements and constraints, interface control documents, hardware and software specifications and designs, test planning, and operating instructions shall be documented as shown in Table 3-1.

Table 3-1 SWSI Documentation

System Requirements Document
System Design Specification
Software Design Specification
Hardware Specification and Configuration
Product Validation Plan
User's Guide
Release History Report
Integrated Logistics Support (ILS) Plan

3.3.2 Facility Requirements

The SWSI shall be initially housed within GSFC Building 13, and possibly be transitioned at a later date to the White Sands Data Services Management Center (DSMC). The facilities shall include a development and test suite of equipment that can emulate the operational configuration. The facility shall include an operational suite of equipment. The operational suite also requires a connection to Open IONET (with applicable IP addresses from NISN) and to Closed IONET (with applicable IP addresses from NISN).

No significant modifications are required to Building 13 to support these facilities. Minor modifications may include adding a connection to Open IONET, running new cables from the SWSI servers to the NISN routers, and adding racks or tables. Power shall be drawn from existing Technical Power panels and power and power cables shall be routed primarily in existing cableways. Where necessary, the SWSI may require new power outlet boxes and cable hangers within the existing underfloor infrastructure.

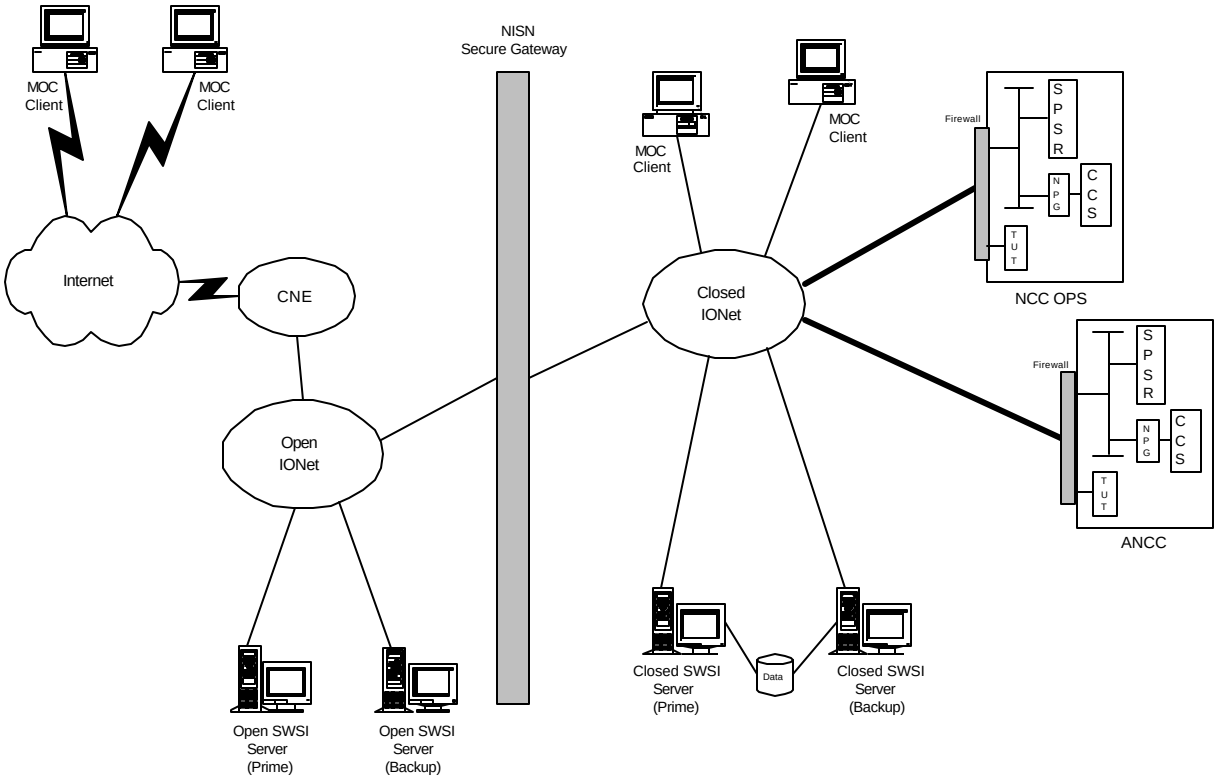

Figure 3-1 SWSI System Diagram

Section 4. System Implementation Strategy

4.1 Approval and Funding

Prior actions have approved the SWSI for implementation. The Collector PCD for GSFC Data Services containing the Web-based NCC Services Interface Product has been approved by the SOMO and funds have been committed under UPN 218-10.

4.2 Acquisition Summary

NASA shall perform SWSI hardware and Commercial Off-The-Shelf (COTS) software procurement. Where possible this procurement will take place using the Scientific and Engineering Workstation Procurement (SEWP) contract. For products not available on SEWP, acquisition will be via establishment of a contract with the appropriate vendor.

4.3 Risk Management

The technical risk associated with SWSI development is low, since established technology has been applied from the outset. An extensive amount of experience was gained by the implementation contractor in developing Java-based systems through work on the Jswitch project. Also, a high degree of success was demonstrated by the SWSI Prototype in support of the LDBP in June 1999.

If a schedule slip occurs in implementation and/or transition to operations, other options are available to accommodate early customers. The SWSI prototype is available for scheduling, real-time, and state vector support for customers in the pre-launch testing phase. For the launch and post-launch phases, the MSOCC UPS is available for scheduling using an X-Windows interface over the Closed IONET. Real-time support may be provided by NCC operators through voice coordination with the customer.

Establishing suitable incentives with the contractor and/or reducing capability in the final system can mitigate cost growth.

Section 5. System Transition, Support, Logistics and Operations

5.1 SWSI Transition to Operations

The Implementation Contractor shall develop an Operations Transition Plan.

5.2 Operations and Maintenance

5.2.1 Operations and Maintenance Approaches

The SWSI shall be operated under the appropriate CSOC Contract Service Level Agreement (CSLA) to provide SN customer interface capabilities for scheduling, service monitoring and control, and state vector storage interfaces. The CSOC contractor shall perform maintenance as an integral function of support to these CSLAs.

5.2.2 Life Cycle Costs

Life cycle costs estimates have been included in the Collector PCD for GSFC Data Services and are available from the SWSI Product Design Lead.

5.3 Support and Logistics

The implementation contractor shall prepare an Integrated Logistics Support Plan that shall define the logistics requirements of the SWSI. The following elements shall be assessed in developing this plan:

a. Maintenance planning
b. Sparing Plan
c. Supply, product, and sales support
d. Support and test equipment
e. Packaging, handling, storage, and transportation
f. Training and logistics support personnel
g. Government furnished and contractor furnished equipment
h. Technical data and documentation

Abbreviations and Acronyms

ANCC	Auxiliary Network Control Center
BB	Bit Block
CCB	Configuration Control Board
CCR	Configuration Change Request
CCS	Communication and Control Segment
CDR	Critical Design Review
CF	Completion Form
CI	Configuration Item
CM	Configuration Management
COTS	Commercial-off-the-Shelf
CSLA	Contract Service Level Agreement
CSOC	Consolidated Space Operations Contract
CSR	Customer Service Representative
DAA	Designated Approving Authority
DCN	Document Change Notice
DR	Design Review
DSI	Delivered Source Instructions
DSMC	Data Services Management Center
FPD	Flight Projects Directorate
GHB	GSFC Handbook
GSFC	Goddard Space Flight Center
GUI	Graphical User Interface
HA	High Availability
HP	Hewlett-Packard
HTML	Hypertext Markup Language
ICD	Interface Control Document
ILS	Integrated Logistics Support
IONET	IP Operational Network

IP	Internet Protocol
Jswitch	Java-based Spacecraft Web Interface to Telemetry and Command Handling
KDSI	One Thousand Developed Source Instruction
LDBP	Long Duration Balloon Project
MOC	Mission Operations Center
MPR	Monthly Progress Report
MSOCC	Multisatellite Operations Control Center
MSP	Mission Services Program
MSR	Monthly Status Review
NASA	National Aeronautics and Space Administration
NCC	Network Control Center
NCCDS	Network Control Center Data System
NHB	NASA Handbook
NISN	NASA Integrated Services Network
NPG	NCCDS Protocol Gateway
O & M	Operations and Maintenance
PC	Personal Computer
PCD	Project Commitment Document
PDR	Product Development Review
PMP	Product Management Plan
POP	Program Operating Plan
PR	Problem Report
RMA	Reliability/Maintainability/Availability
SERB	Systems Engineering Review Board
SEWP	Scientific and Engineering Workstation Procurement
SMP	System Management Plan
SN	Space Network
SODA	Space Operations Directive Agreement
SOMO	Space Operations Management Office
SPSR	Service Planning Segment Replacement

SSL	Secure Socket Layer
SWSI	Space Network Web Services Interface
TCP	Transmission Control Protocol
TDRS	Tracking and Data Relay Satellite
TDRSS	TDRS System
TRR	Test Readiness Review
TRR	Transition Readiness Review
TUT	TDRSS Unscheduled Time
UPN	Unique Project Number
UPS	User Planning System
USM	User Schedule Messages